Memorandum

Michael Lindgren
Chief Accelerator Officer

Accelerator Division
P.O. Box 500, MS 306
Kirk Road and Pine Street
Batavia, Illinois 60510-5011

Office: 630.840.8409
mlindgre@fnal.gov

Date: November 18, 2020

To: Todd Sullivan

From: Michael Lindgren

Michael Lindgren, UID:mlindgre
Digitally signed by Michael Lindgren, UID:mlindgre
Date: 2020.11.18 12:33:17 -06'00'

Re: Approval for Running Booster-Neutrino Beam

Safety documentation and procedures for running beam to the Booster-Neutrino area are in place. Therefore, you are hereby authorized to run beam to the Booster-Neutrino.

cc: G. Annala
M. Convery
P. Czarapata
S. McGimpsey
M. Schoell

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ADAP-11-0001
REV. 9

SYSTEM START-UP SIGN-OFF

The signatures below, unless noted in the comments section, indicate that the relevant systems are ready for the restart of beam operation. Indicate in the comments section any remaining work that would affect the restart of beam operations. Indicate N/A for departments that did not do any work on the system.

SYSTEM BEING SIGNED OFF: (Circle as Applicable)
Linac NIF MTA Booster [8-GeV Line-MI-10 Region] [MI-20-MI-62/Recycler] (BNB) NuMI P1-P2 Muon P3-Switchyard Meson Primary MT MC NM FAST _____

DEPARTMENT	DATE	SIGNATURE (Department Head/Designee)
1. Controls	10/20/20	Ann Vogel for J. Patrick
2. Cryogenics	N/A	
3. E/E Support	11/9/20	Chris Jensen Digitally signed by Chris Jensen DN: cn=Chris Jensen, o, ou=Fermilab, email=cjensen@fnal.gov, c=US Date: 2020.11.09 14:44:21 -06'00'
4. RPO Manager	11/18/20	Madelyn Schoell, UID:maddiew Digitally signed by Madelyn Schoell, UID:maddiew Date: 2020.11.18 11:25:43 -06'00'
5. LSO	N/A	
6. External Beamlines	11/18/20	Thomas R. Kobilarcik Digitally signed by Thomas R. Kobilarcik Date: 2020.11.18 12:34:15 -06'00'
7. Instrumentation	13 OCT 20	
8. Interlocks	11/9/20	Randy Zifko, UID:rmzifko Digitally signed by Randy Zifko, UID:rmzifko Date: 2020.11.09 10:52:48 -06'00'
9. Main Injector	21 OCT 2020	
10. Mechanical Support	8 Oct 2020	
11. Muon	N/A	
12. Operations	10/26/2020	
13. Proton Source	N/A	
14. RF	N/A	
15. ENG Support	10/7/2020	
16. Target Systems	11/5/20	
17. Shutdown Coordinator	10/12/2020	

Comments and special conditions (please mark comment with department # to connect comment with appropriate department):

Power supplies ready for start-up

The BNB radiation shielding meets the requirements documented in the 2002 "Shielding Assessment Document for the 8 GeV Fixed Target Station" and 2004 "Addendum to the MiniBooNE Target Facility" shielding assessment.

FINAL APPROVALS

System Department Head: Thomas R. Kobilarcik Digitally signed by Thomas R. Kobilarcik Date: 2020.11.18 12:36:31 -06'00' — Date 11/18/20

Assigned RSO: Madelyn Schoell, UID:maddiew Digitally signed by Madelyn Schoell, UID:maddiew Date: 2020.11.18 12:54:47 -06'00' — Date 11/18/20

AD Division Head: Michael Lindgren, UID:mlindgre Digitally signed by Michael Lindgren, UID:mlindgre Date: 2020.11.18 12:56:07 -06'00' — Date _____

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ADAP-11-0001 Rev. 9

BEAM PERMIT
11/18/2020

Booster-Neutrino Accelerator Safety Envelope (ASE) Limit

The maximum beam intensity transmitted through the Booster-Neutrino Beamline is limited to: 9.00×10^{18} protons/hr at 8 GeV.

No accelerator or beam line will transmit beam without an operational beam interlock safety system.

Booster-Neutrino Beamline Operating Limits

The maximum beam intensity transmitted through the Booster-Neutrino Beamline is limited to: 1.62×10^{17} protons/hr at 8 GeV

Examples:

Charge/hr = number of pulses/hr x number of protons/pulse

#1 18,000 pulses per hour at 9.00×10^{12} protons per pulse = 1.62×10^{17} protons per hour.

Special conditions and comments:

Reviewed by Todd Sullivan — Digitally signed by Todd Sullivan Date: 2020.11.18 12:56:45 -06'00'
Operations Department Head

Reviewed by Thomas R. Kobilarcik — Digitally signed by Thomas R. Kobilarcik Date: 2020.11.18 12:39:48 -06'00'
Systems Department Head

Reviewed by Madelyn Schoell, UID:maddiew — Digitally signed by Madelyn Schoell, UID:maddiew Date: 2020.11.18 12:52:51 -06'00'
Assigned RSO

Reviewed by Madelyn Schoell, UID:maddiew — Digitally signed by Madelyn Schoell, UID:maddiew Date: 2020.11.18 12:53:06 -06'00'
ESH Radiation Physics Operations Department Head

Approved by Michael Lindgren, UID:mlindgre — Digitally signed by Michael Lindgren, UID:mlindgre Date: 2020.11.18 13:39:45 -06'00'
Accelerator Division Head

Operator Signatures

Crew Chiefs

11/18/20

11/18/20

11/19/20

11/19/20

21 Nov 20

Crew A

11/2/20

11-21-20

11/21/2020

11-24-20

11-22-20

Crew B

Crew C

11/18/20

11/18/20

11/18/2020

11/20/20

Crew D

11/18/20

11-19-20

19 Nov 2020

11/19/20

Crew E

11/19/20

19 Nov 2020

11/19/20

11/19/20

Other

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Running Condition
Booster Neutrino

November 18, 2020

Area RSO Maddie Schoell

Mode of Operation Beam from Cell 850 to BNB Target Station (Beam on Target)

Beam Limits

Beam Energy	ASE Limit	Operating Limit
8 GeV	9.00 E18 protons/hr	1.62 E17 protons/hr

Critical Devices E:HV860 & BS860

Enclosures Protected MI-12A, MI-12B & MI-13

Preferred Monitoring Devices* Intensity is monitored via E:TOR860

*Other methods of monitoring intensity may be used.

Requirements

Access Devices E:HV860 & BS860 must be disabled in order to access MI-12A, MI-12B or MI-13.

Cool Off Period MI-12A & MI-12B: MI-12A Exhaust Air Monitor (G:RD1139) and MI-12B ENC Air Monitor (G:RD1153) must both be reading ≤ 400 cpm before access unless waived by RSO or designee.

Special Interlocks The CDC Inputs including failure mode devices may all be found on the Safety System Status pages.

Special Concerns Any work performed on critical devices or obtaining a critical device key requires prior RSO approval.

The 1,000 cfm fans may only be turned on once the cool-off period has elapsed and prior RSO or designee approval has been received. See Operation Comments for more information.

Gates, Fencing and Passive Shielding Requirements There is no access to radiologically fenced areas without prior RSO approval.
The removable shielding is locked with a PAD 118 and a MI-12B enclosure key.
MI-13 Enclosure hatch is locked with a shielding configuration control (PAD118) lock and MI-13 key.

Shielding, fencing and posting are in accordance with the following shielding assessment documents:
1. 2002 Shielding Assessment Document for the 8GeV Fixed Target Facility,
2. 2002 MiniBooNE Target Station Shielding Assessment,
3. 2004 Addendum to the MiniBooNE Target Station Shielding Assessment,
4. 2010 Post Assessment Memo - 8GeV Beamline and MiniBooNE Beam Line Nova-Era Operational Limits.

Assigned RSO approval also signifies that all necessary Interlock Tests have been completed and Removable Shielding is installed.

ps. Dept. Head Approval Todd Sullivan Digitally signed by Todd Sullivan Date: 2020.11.18 12:57:39 -06'00'

Assigned RSO Approval Madelyn Schoell, UID:maddiew Digitally signed by Madelyn Schoell, UID:maddiew Date: 2020.11.18 12:54:04 -06'00'

Sys. Dept. Head Approval Thomas R. Kobilarcik Digitally signed by Thomas R. Kobilarcik Date: 2020.11.18 12:38:50 -06'00'

AD Head Approval Michael Lindgren, UID:mlindgre Digitally signed by Michael Lindgren, UID:mlindgre Date: 2020.11.18 13:38:51 -06'00'

Operational Comments

MCR must be appropriately staffed according to the Accelerator Safety Envelope.

The following Beam Permit System inputs cannot be bypassed without RSO notification:

Horn Stripline Air Pressure
BNB Target Cave Exhaust Fan
MI-12A fan volume between 150-300cfm (E:12AAIR)

The MI-12 Sump Pump high level is monitored by FIRUS. If this sump alarms, contact the RSO or designee.

The following are the air monitors for MI-12A and MI-12B enclosures and service building. If any of these air monitors alarm, contact the RSO or designee.

G:RD1139 - MI-12A Exhaust Air Monitor
G:RD1152 - MI-12 Service Building Air
G:RD1153 - MI-12B Enclosure Air Monitor
G:RD1155 - MI-12 AMS3 Air Monitor
E:12AAIR - MI-12 Enclosure Air Flow, the 200 cfm fan

All six Decay Region Wells and Pumps, along with the Retention Tank associated with Wells 3 and 6, except for Well 5, are monitored on ACNET Page device E:MINIDW with acknowledgeable alarms. If an alarm is received contact the RSO or designee.

A key to control the 1,000 cfm intake & exhaust fans for the MI-12A & MI-12B enclosure has been installed in the MCR. This key is located in the remote key-tree camera access panel in the second row, 12th position. The purpose of this key is to disable the operation of 1,000 cfm fans before beam is permitted to the Booster Neutrino area, and enable the 200 cfm exhaust fan. The interlock system monitors the status of the remote fan contactors and the two shutters for the 1,000 cfm fans via the critical device controller. With the key out or in the removable position, the 1,000 cfm fans & shutters are disabled. With the key turned in the non-removable position the 1,000 cfm fans & shutters are permitted to be on & open.

During Booster Neutrino beam operations this key **MUST** be removed from the panel and placed in a locked Crew Chief box to avoid accidental turning on of the 1,000 cfm fans. This key **may not** be returned to the key-tree nor may the 1,000 cfm fan be turned on without ensuring that MI-12A Exhaust Air Mon (G:RD1139) and MI-12B ENC Air Monitor (G:RD1153) are both reading < 400 cpm and prior RSO or designee approval is obtained. Turning the 1,000 cfm fans on during Booster Neutrino operation will disable the Booster Neutrino critical device controller, however it also provides the potential for the discharge of activated air.

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Running Condition
Booster Neutrino

November 18, 2020

Area RSO Maddie Schoell

Instrument Information

All detector trips shall be documented in the E-log.
Interlocked detectors (i.e., Chipmunk, FOX, Scarecrow, TLM, etc.) in "Integrate" mode that trip will not allow a safety system reset until sufficient time has passed to keep the hourly dose rate equal to or below the trip point setting. Interlocked detectors in "Integrate" mode that trip may be reset as the safety system allows. If there are more than three (3) trips by an interlocked detector in "Integrate" mode in one hour, RSO approval is required before reset.

MUX	Type	Location	QF	R/I Mode	Trip Level	CDC	Device(s) Tripped
1-150	Chipmunk	MI-12 Serv. Bldg Upstairs Stripline Pen.	5	Integrate	5 mrem/hr	E:BNECRD	E:HV860 & BS860
1-148	Chipmunk	MI-12B Shield Blocks	5	Integrate	5 mrem/hr	E:BNECRD	E:HV860 & BS860
1-147	Chipmunk	MI-12 Service Building Downstream	5	Integrate	5 mrem/hr	E:BNECRD	E:HV860 & BS860
1-146	Chipmunk	MiniBooNE Berm US of MI-12	5	Integrate	1 mrem/hr	E:BNECRD	E:HV860 & BS860
1-145	Chipmunk	MiniBooNE Berm Indian Creek Culvert	5	Integrate	1 mrem/hr	E:BNECRD	E:HV860 & BS860
1-144	Chipmunk	MiniBooNE Indian Creek Road	5	Integrate	1 mrem/hr	E:BNECRD	E:HV860 & BS860
1-137	Chipmunk	MI-12A Upstream Berm	5	Integrate	1 mrem/hr	E:BNECRD	E:HV860 & BS860

Note: QF only included for chipmmunks

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Booster Neutrino

November 18, 2020

Area RSO Maddie Schoell

Operator Signatures

Crew Chiefs

11/18/20

11/19/20

11/19/20

11/19/20

21 Nov 20

Crew A

11/21/20

11-21-20

11/21/2020

11-21-20

11-22-20

Crew B

Crew C

11/19/20

11/18/20.

11/18/2020

11/20/20

Crew D

11/19/20

11-19-20

19 Nov 2020

11/19/20

Crew E

11/19/20

19 Nov 2020

11/19/20

11/19/20

Other